CLAIMS

1. A synchronous compensator plant comprising at least one rotating electric machine having at least one winding, characterized in that the winding in at least one of the electric machines comprises an insulation system including at least two semiconducting layers, each layer constituting essentially an equipotential surface and also including solid insulation disposed therebetween.

2. A plant as claimed in claim 1, ~~characterized in that~~ wherein at least one of the layers has substantially the same coefficient of thermal expansion as the solid insulation (layer).

3. A plant as claimed in either of claims 1 or 2, characterized in that the insulation is built up of a cable (6) intended for high voltage and comprising one or more current-carrying conductors (31) surrounded by at least one semiconducting layer (32, 34) with intermediate insulating layer (33) of solid insulation.

4. A plant as claimed in claim 3, characterized in that the innermost semiconducting layer (32) is at substantially the same potential as the conductor(s) (31).

5. A plant as claimed in either of claims 3 or 5, characterized in that the one of the outer semiconducting layers (34) is arranged to form essentially an equipotential surface surrounding the conductor(s) (31).

6. A plant as claimed in claim 5, characterized in that said outer semiconducting layer (34) is connected to a selected potential.

7. The plant as claimed in claim 6, ~~characterized in that~~ wherein the selected potential is earth potential.

8. A plant as claimed in any of claims 3-7, characterized in that at least two of said layers have substantially the same coefficient of thermal expansion.

9. A plant as claimed in any of claims 3-5, characterized in that the current carrying conducting comprises a plurality of strands, only a few of the strands being uninsulated from each other.

10. A plant as claimed in any of claims 1-9, characterized in that the winding consists of a cable

comprising one or more current-carrying conductors (2), each conductor consisting of a number of strands, an inner semiconducting layer (3) being arranged around each conductor, an insulating layer (4) of solid insulation being arranged around each inner semiconducting layer (3) and an outer semiconducting layer (5) being arranged around each insulating layer (4).

11. The plant as claimed in claim 10, ~~characterized in that~~ wherein the cable ~~also~~ comprises a metal screen and a sheath.

12. A plant as claimed in any of the preceding claims, characterized in that the magnetic circuit is arranged in a rotating electric machine, the stator (3) of which is cooled at earth potential.

13. A plant as claimed in any of the preceding claims, characterized in that the magnetic circuit of the electric machine comprises a stator winding placed in a slot (5), said slot (5) being designed as a number of cylindrical openings (7) running axially and radially outside each other, having substantially circular cross section and separated by narrow waist parts (8) between the cylindrical openings.

14. A plant as claimed in claim 13, ~~characterized in that~~ wherein the phases of the stator winding are Y-connected.

15. A plant as claimed in claim 14, ~~characterized in that~~ wherein the Y-point of the stator winding is insulated from earth potential or connected to earth potential via a high-ohmic impedance and protected from over-voltages by means of surge arresters.

16. The plant as claimed in claim 14, wherein ~~characterized in that~~ the Y-point of the stator winding is earthed via a suppression filter of third harmonic type, which suppression filter is designed to greatly reduce or eliminate third harmonic currents in the electric machine at the same time as being dimensioned to limit voltages and currents in the event of faults in the plant.

17. The plant as claimed in claim 16, wherein ~~characterized in that~~ the suppression filter is protected from over-voltages by means of surge arresters, the latter being connected in parallel with the suppression filter.

18. A plant as claimed in claims 3 and 14, characterized in that the cable (6) constituting the stator winding has a gradually decreasing insulation seen from the high-voltage side towards the Y-point.

19. The plant as claimed in claim 18, wherein ~~characterized in that~~ the gradual decrease in the insulation thickness is stepwise or continuous.

20. A plant as claimed in claims 13 and 18, characterized in that the circular cross section (7) of the substantially cylindrical slots (5) for the stator winding has decreasing radius seen from the yoke portion towards the rotor.

21. A plant as claimed in any of claims 12-20, characterized in that the rotating part has an inertia and electromotive force.

22. The plant as claimed in claim 21, wherein ~~characterized in that~~ the machine can be started from a local power supply.

23. The plant as claimed in claim 22, wherein ~~characterized in that~~ the machine has two or more poles.

24. The plant as claimed in claim 23, characterized in that the rotor (2) and the stator (3) are so dimensioned that at nominal voltage, nominal power factor and over-excited operation, the thermally based current limits of stator and rotor are exceeded approximately simultaneously.

25. A plant as claimed in claim 23, characterized in that the rotor (2) and the stator (3) are so dimensioned that at nominal voltage, nominal power factor and over-excited operation, the thermally based stator current limit is exceeded before the thermally based rotor current limit has been exceeded.

26. A plant as claimed in either of claims 24 or 25, characterized in that is has 100% overload capacity at nominal voltage, nominal power factor and at over-excited operation.

27. A plant as claimed in claim 24 or claim 25, characterized in that the rotor poles are pronounced.

28. The plant as claimed in claim 27, wherein ~~characterized in that~~ the quadrature-axis synchronous reactance is considerably less than the direct-axis synchronous reactance.

29. The plant as claimed claim 28, wherein ~~characterized in that~~ the machine is equipped with excitation systems enabling both positive and negative excitation.

30. A plant as claimed in any of claims 3-29, characterized in that the cables (6) with solid insulation intended

for high voltage have a conductor area between 30 and 3000 mm^2 and have an outer cable diameter of between 20 and 250 mm.

31. A plant as claimed in any of the preceding claims, characterized in that the stator and rotor circuits (3, 2) are provided with cooling means in which the coolant is in liquid and/or gaseous form.

32. A plant as claimed in any of the preceding claims, characterized in that the machine is arranged for connection to several different voltage levels.

33. A plant as claimed in any of claims 1-32, characterized in that the machine is connected to the power network without any step-up transformer.

34. A plant as claimed in any of the preceding claims, characterized in that the winding of the machine is arranged for self-regulating field control and lacks auxiliary means for control of the field.

35. The A synchronous compensator plant comprising at least one rotating electric machine having at least one winding, ~~characterized in that~~ wherein the winding has an insulation system which, as regards its thermal and electrical properties, permits a voltage level in the machine exceeding 36 kV.

36. A synchronous compensator plant as claimed in claim 35, characterized in that it includes the features defined for the plant as claimed in any of claims 1-34.

37. The A rotating electric machine in the form of a synchronous compensator having at least one winding, ~~characterized in that~~ wherein the winding comprises an insulation system including at least two semiconducting layers, each layer constituting essentially one equipotential surface, with solid insulation disposed therebetween.

38. A rotating electric machine as claimed in claim 37, characterized in that it includes the features defined for the electrical machine in the plant as claimed in any of claims 2-36.